

Marking and Punch Marking – Course: Technique for Manual Working of Materials. Instruction Examples for Practical Vocational Training

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Marking and Punch Marking – Course: Technique for Manual Working of Materials. Instruction Examples for Practical Vocational Training

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Introduction

The present material contains 7 selected instruction examples which are intended to help practising main techniques of scribing and prick–punching with increasing level of difficulties. The examples represent scribing of simple straight, angular and parallel lines as well as of curved lines and lines with check marks.

For selected materials special importance is attached to the preparation of scribed lines applying special coating agents (copper sulphate solution and whiting).

On completion of the workpieces by the operations additionally specified for completion in the sequence of operations, all workpieces produced may be used in practice:

The open–end wrench, drill stand, angle gauge and clamp may be immediately used in the workshop, the bow for a C clamp needs to be completed by other parts.

The dimensions of the door lock panel may be modified as specified by the instructor according to the requirements. The base plate may be used to support a work lamp.

In scribing, cleanness and uniformity of the scribed lines are essential. Check marks should be punched slightly only.

In order to facilitate the preparation and execution of the work, the necessary materials, measuring and testing tools, hand tools and accessories are stated. Moreover, knowledge required in addition to knowledge of marking and punch–marking is mentioned.

Working drawings are attached and the sequence of operations is given in a favourable order.

Explanation to the specification of material:

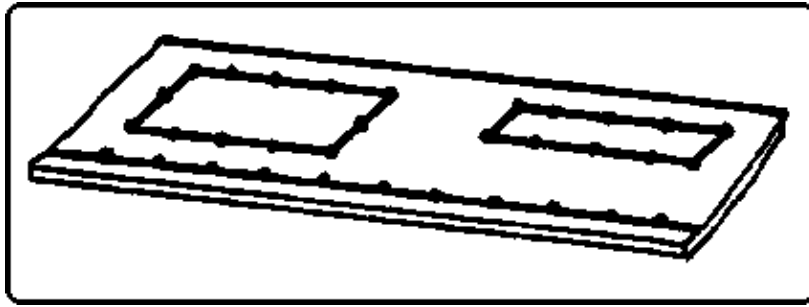
The steel is specified according to the value of its tensile strength in the unit “Megapascal” (MPa).

Instruction example 2.1. Door lock panel

To practise scribing of straight and parallel lines with steel measuring tool, steel straight edge and steel scriber based on datum edges.

Material

Sheet steel (approx. 380 MPa), rolled
 Thickness: approx. 2 mm
 Width: approx. 30 mm
 Length: approx. 240 mm
 (One longitudinal edge and one end edge to be flat and at right angle)



Hand tools

Smooth-cut file 300 mm (flat), steel scriber, prick punch, engineers' hammer

Measuring and testing tools

Steel measuring tool, steel straight edge, try square

Accessories

Surface plate, copper sulphate solution, brush

Required previous knowledge

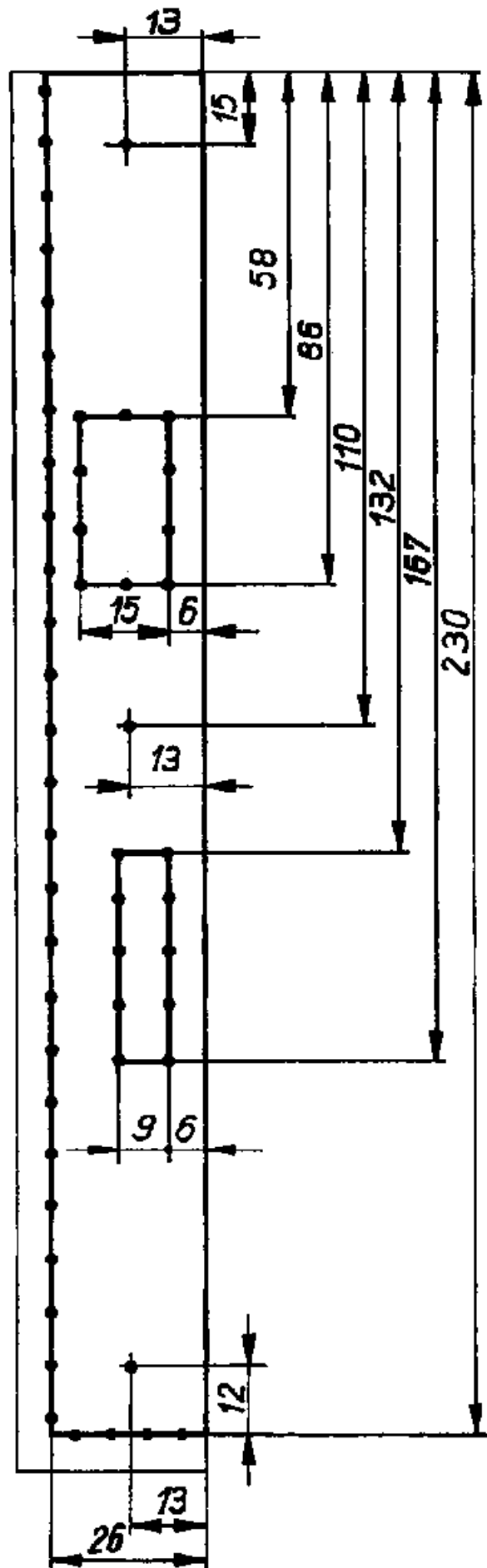
Reading of drawings, measuring, testing.

Sequence of operations	Comments
1. Arrange the working place, prepare the working materials.	– Check for completeness.
2. Check the edges for flatness and squareness, if necessary file one longitudinal edge and one end edge flat and at angle of 90°.	– Check with try square (upper edge – right-hand longitudinal edge)
3. Coat steel sheet surface with copper sulphate solution and let it dry.	– Danger: copper sulphate solution is toxic.
4. Lay off with steel measuring tool 3 measuring points (size 26 mm) over the length of the pre-worked longitudinal side (right-hand datum edge) and mark with steel scriber.	
5. Line up the measuring points with steel straight edge and connect such points with scriber.	– Hold steel straight edge firmly in place.
6. Lay off with steel measuring tool 2 measuring points (size 230 mm) on pre-worked end side (datum edge on top), mark and connect them.	
7. Scribe all other inner contours as described above, always based on the two datum edges.	
8. Prick-punch check marks over all scribed lines at 7 – 10 mm distances.	– Prick-punch just slightly'

9. Final inspection.	– Dimensions and cleanness of scribed lines.
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Completion

Drill and file to size the rectangular inner contours. Cut the outer edges by saw or shear. Slightly chamfer all edges. Drill the 3 holes for fixing to the door frame.



2.1.

5

Door lock panel

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Instruction example 2.2. Holding Clamp

To practise scribing of straight and angular lines by means of try square and protractor, based on one datum edge and on datum lines.

Material

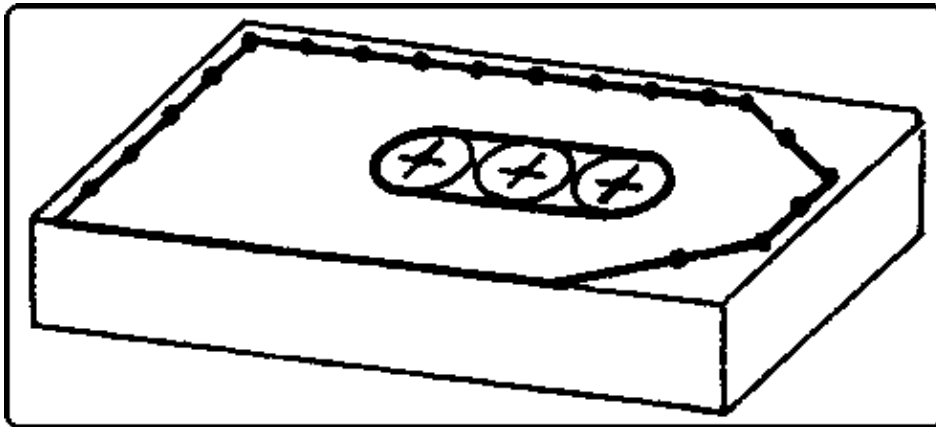
Sheet steel

Thickness: approx. 20 mm

Width: approx. 50 mm

Length: approx. 110 mm

(One longitudinal edge to be flat)



Hand tools

Steel scriber, dividers, prick punch, centre punch, engineers' hammer.

Measuring and testing tools

Steel measuring tool, try square, universal protractor, steel straight edge.

Accessories

Surface plate,

Required previous knowledge

Reading of drawings, measuring, testing.

Sequence of operations	Comments
1. Arrange the working place, prepare the working materials.	– Check for completeness.
2. Check flatness of one longitudinal side, if necessary prepare one longitudinal side as datum edge.	
3. Scribe left-hand and right-hand end sides to specified size (100 mm distance) by means of try square and scriber.	
4. Mark second longitudinal side and centre line with steel measuring tool, based on datum edge, and scribe (connect) by means of steel straight edge and scriber.	

5. Lay off the tapered lines (30°) at the right-hand end side by means of universal protractor, based on the longitudinal sides.	– Line up exactly!
6. Mark the end points of the oblong hole on the centre line (steel measuring tool and scribe).	
7. Set the dividers to 8.0 mm by means of steel measuring tool and scribe from the end points of the oblong hole inward. Prick-punch with centre punch and scribe radii with dividers. Mark and prick-punch centre punch mark.	
8. Scribe longitudinal sides of oblong hole by means of steel straight edge and scribe.	
9. Prick-punch check marks on all scribed lines at 7 – 10 mm distances	
10. Final inspection.	– Dimensions and cleanness of scribed lines.

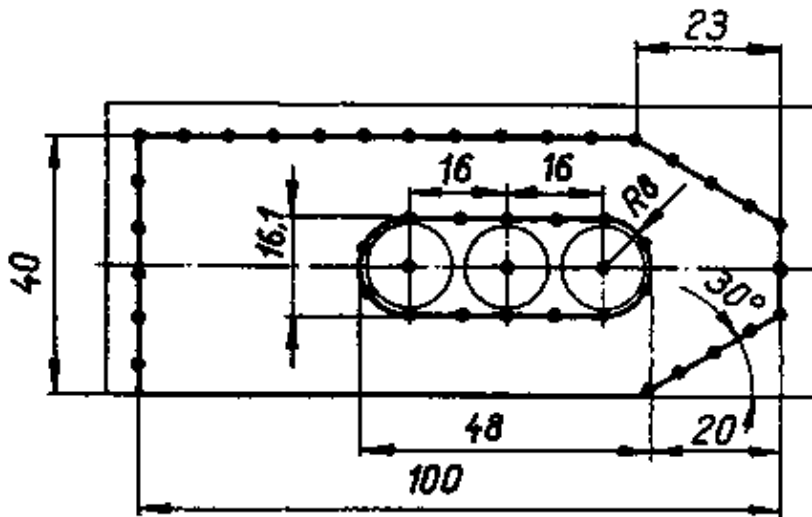
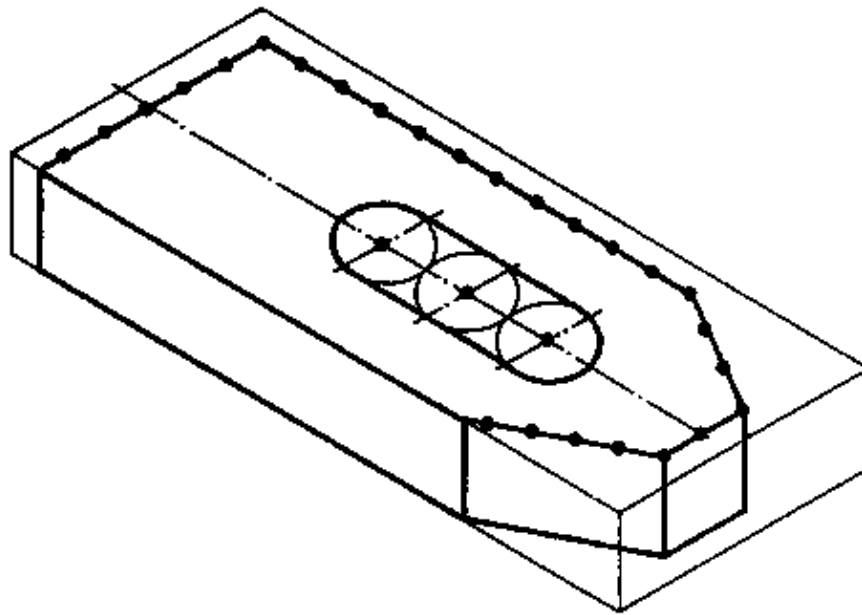
Note

The clamp together with instruction example 5.1. (step block)

5.2. (tenon block)

5.5. (box wrench)

and a bolt M16 with washer and nut M16 form a complete set of clamping tools for an upright drilling machine.



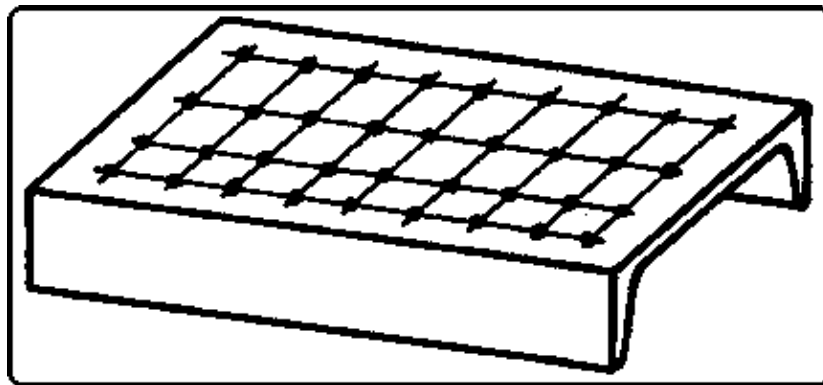
				2.2.
			<p style="text-align: center;">Holding Clamp</p>	3102

Instruction example 2.3. Drill stand

To practise scribing of straight and parallel lines with scribing blocks, based on datum edges.

Material

U-section (approx. 380 MPa)
 Web width: 80 mm
 Flange height: 45 mm
 Length: 120 mm
 (see also training example 4.2.)



Hand tools

Scribing blocks (marking gauge and steel scribe or caliper gauge or height gauge), centre punch, engineers' hammer.

Measuring and testing tools

Steel measuring tool

Accessories

Surface plate, whiting, brush

Required previous knowledge

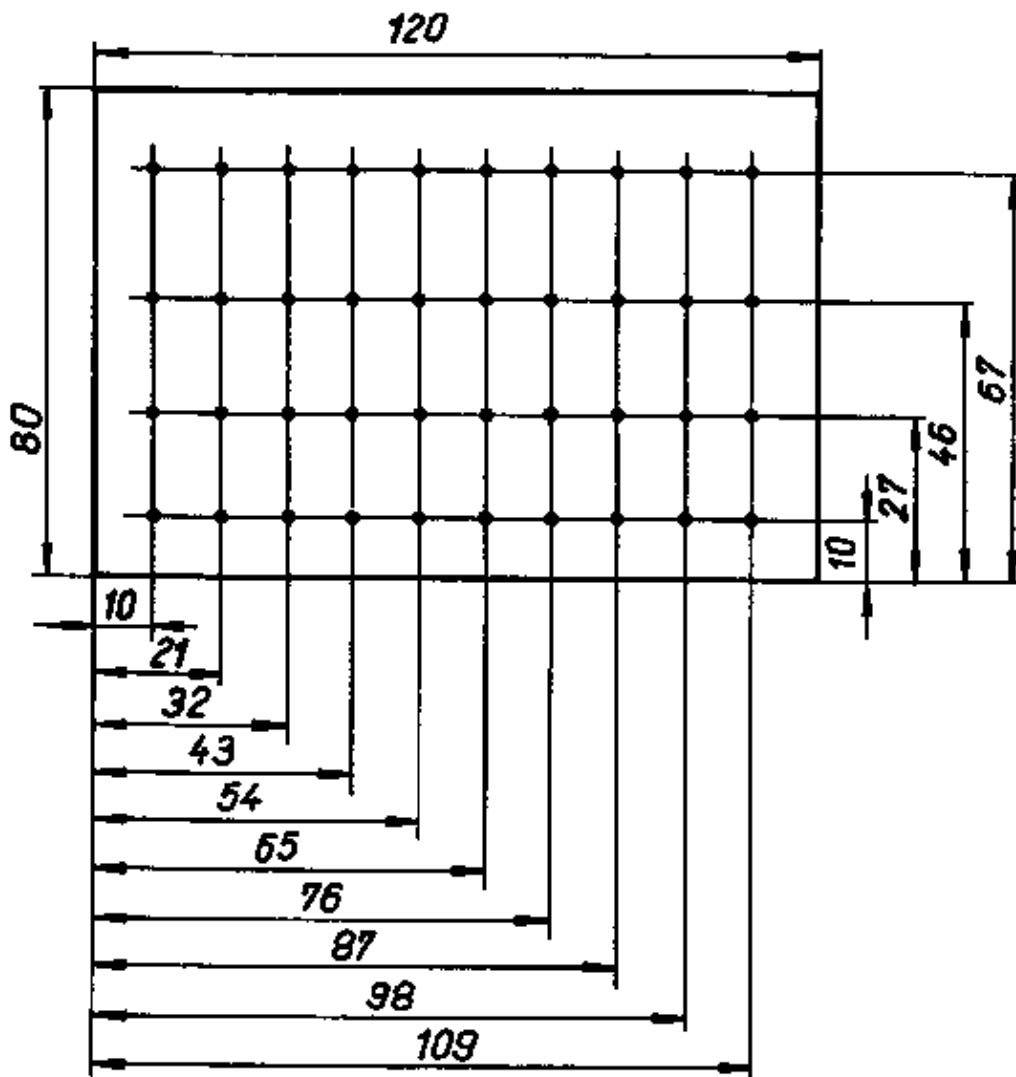
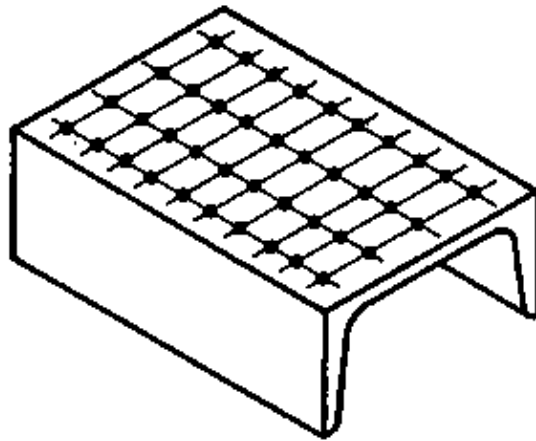
Reading of drawings, measuring

Sequence of operations	Comments
1. Arrange the working place, prepare the working materials.	– Check for completeness.
2. Check datum edges/datum faces for flatness and squareness.	– If necessary re-work(file).
3. Coat surface with whiting and let it dry.	
4.1. For scribing blocks without scale, set the distances according to drawing by means of steel measuring tool and scribe step by step, based on the datum edges.	– Line up exactly with the datum edges! Do not cant!
4.2. For scribing blocks with scale, set the distances according to drawing directly	

at the gauge and scribe step by step, based on the datum edges.	
5. Prick-punch points of intersections of scribed lines heavily by means of centre punch	
6. Final inspection.	- Dimensions, parallelism and cleanness of scribed lines.

Completion

Drill the holes with drill diameters as required (to be specified by the instructor or as per instruction example 7.4.). Produce a stringer plate to support the tools to be inserted. Clean the surface and mark for identification.



				2.3.
	Drill stand			3102

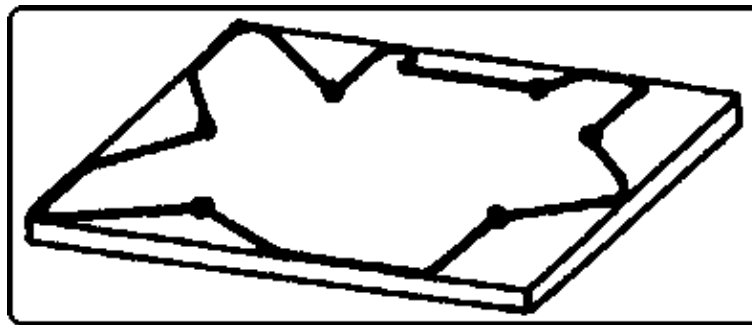
Drill stand

Instruction example 2.4. Angle gauge

To practise scribing of angular lines by means of protractor, based on datum edges.

Material

Sheet steel, bright
 (approx. 380 MPa)
 Thickness: approx. 2.5 mm
 Width: approx. 40 mm
 Length: approx. 70 mm
 (Edges to be flat and at right angles to each other).



Hand tools

Smooth-cut file 200 mm (flat), caliper gauge, steel scribe, centre punch, engineers' hammer.

Measuring and testing tools

Bevelled edge square, universal protractor

Accessories

Surface plate, scribing varnish, brush

Required previous knowledge

Reading of drawings, measuring, application of the mathematical law of the sum of interior angles ($? + ? + ? = 180^\circ$), use of the universal protractor.

Sequence of operations	Comments
1. Arrange the working place, prepare the working materials.	– Check for completeness.
2. Check for size and squareness of outer edges. Coat the surface with scribing varnish.	
3. Scribe the hole centres with the caliper gauge and punch with centre punch.	– Proceed step by step, based on the outer edges!
4. Scribe all angles, based on outer edges, by means of universal protractor (locate the try square and scribe with scribe from the punch mark outward). Example: angle 90. Bisector bisects 90° into two 45° angles forming 90° angle with outer edge, angle to be set on universal protractor, therefore: 45° . ($45^\circ + 90^\circ + 45^\circ = 180^\circ$).	– Calculate the complementary angles by means of the law of the sum of interior angles!
5. Final inspection.	– Dimensions and cleanness of scribing.

Completion

Drill the punched centres of angles with 1.5 mm diameter.

Saw out the angles. File to size and chamfer inner edges.

Mark angles. – Explanation:

116 – 118° point angle of drill (normal material)

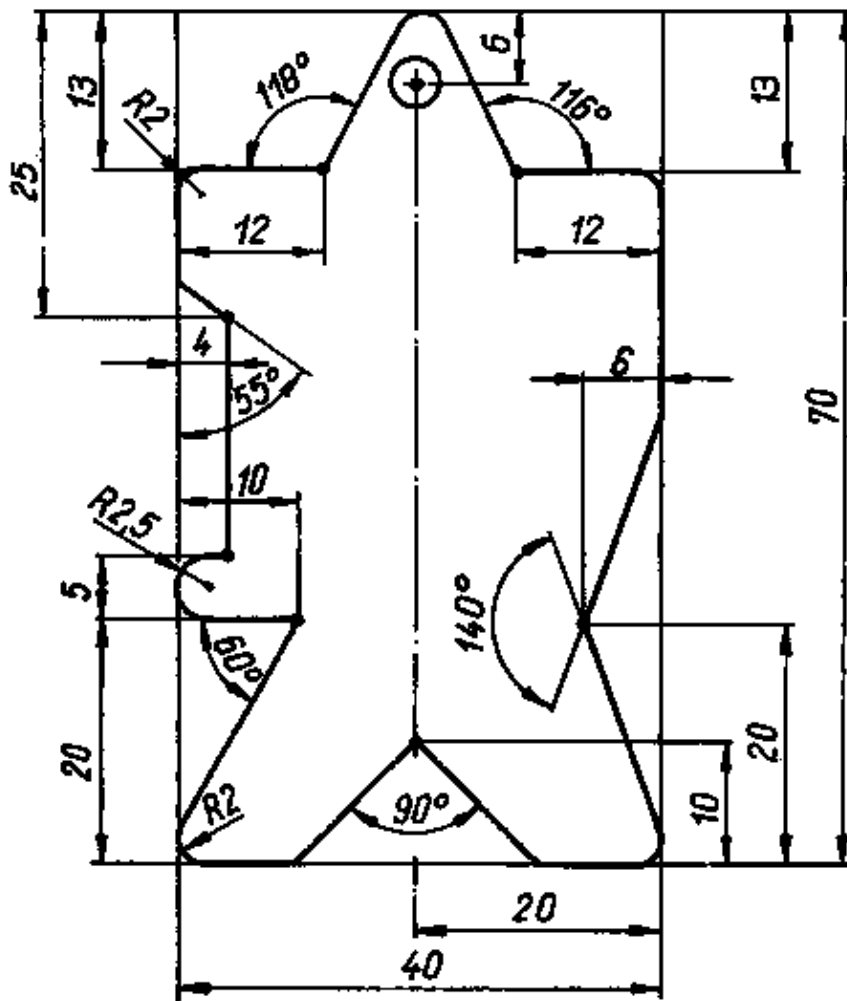
90° point angle of drill (hard material)

140° point angle of drill (soft material)

55° chisel edge angle of drill

60° wedge angle of chisel, prick–punch.

Drill 4 mm dia. hole at size 6 mm (punch mark on top)



					2.4.
				Angle gauge	3102

Angle gauge

Instruction example 2.5. Bow for C clamp

To practise scribing of lines with height gauge and dividers, based on datum edges and one datum line and producing a bore line.

Material

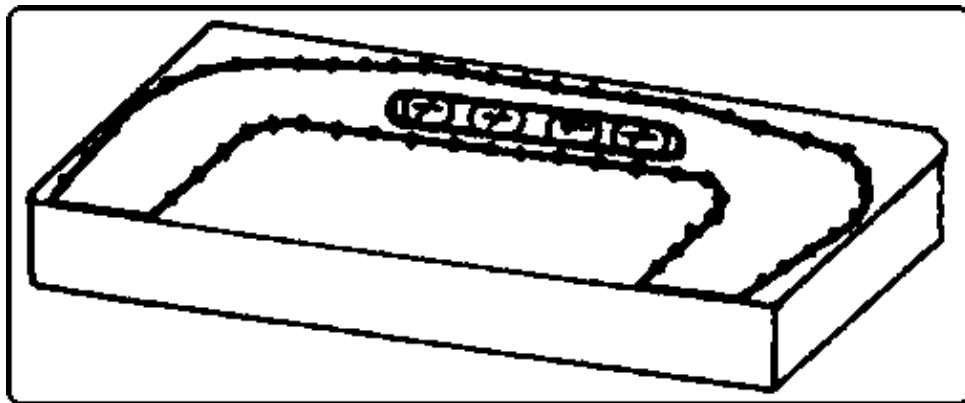
Sheet steel (approx. 380 MPa)

Thickness: approx. 8 mm

Width: approx. 80 mm

Length: approx. 115 mm

(One longitudinal side and end side to be flat and at right angle)



Hand tools

Smooth-cut file 300 mm (flat), height gauge, steel scribe, dividers, marking-out punch, centre punch, double-point punch, engineers' hammer.

Measuring and testing tools

Steel measuring tool, steel straight edge, bevelled edge square.

Accessories

Surface plate, angle plate, steel parallel as support (if height gauge cannot be started at zero level).

Required previous knowledge

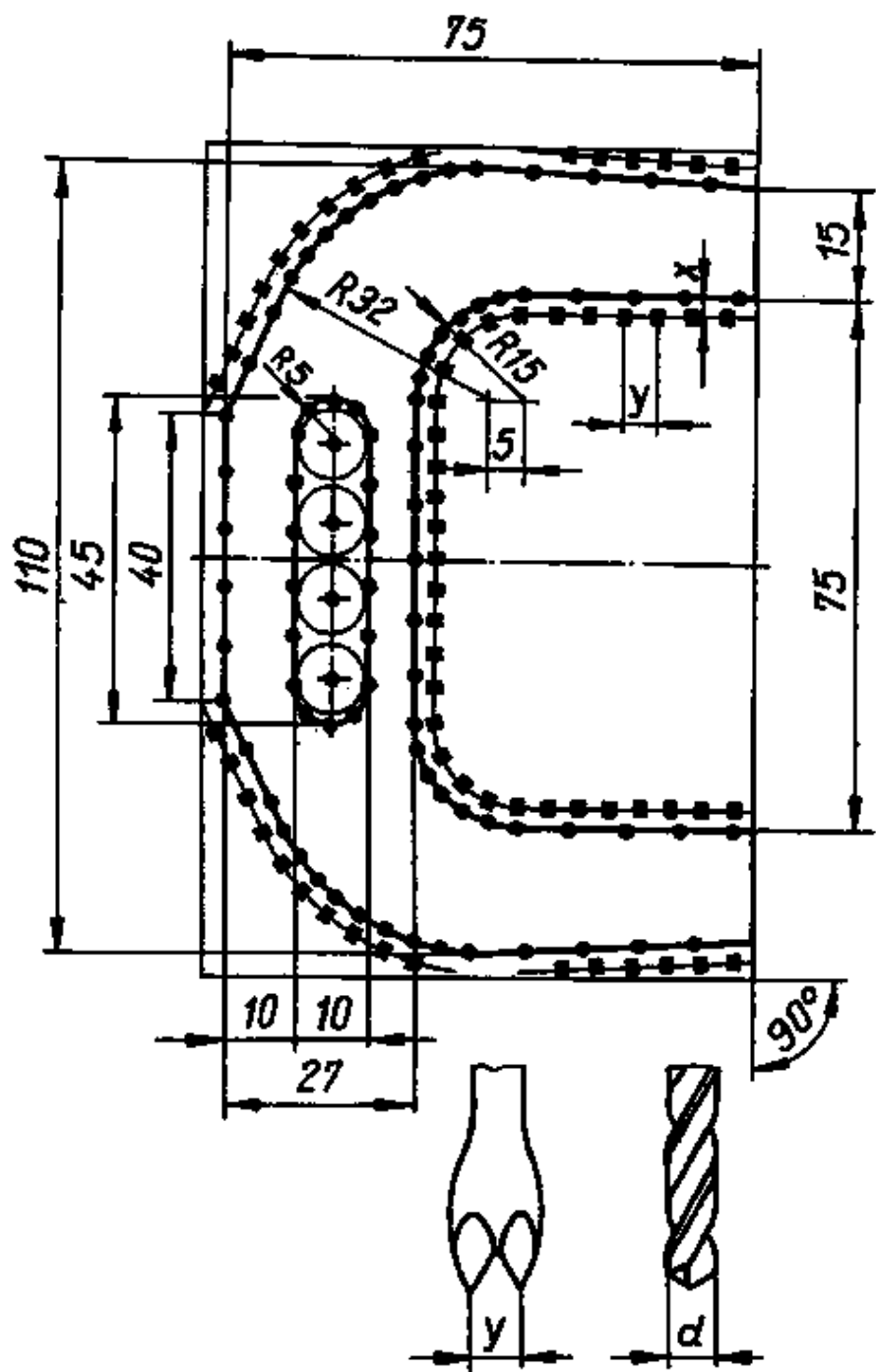
Reading of drawings, measuring, use of the height gauge, application of simple mathematical equations.

Sequence of operations	Comments
1. Arrange the working place, prepare the working materials.	– Check for completeness.
2. Check the two datum edges (one longitudinal side and one end side to be flat and at right angle).	– File and check with bevelled edge square, if datum edges are not meeting the requirements.
3. Put the steel sheet on the worked end-side edge and set the scribe of the height gauge to “zero” level.	– If the height gauge cannot be set to zero level because of foot height, an adequate steel parallel is to be used as support for the workpiece.
4. Scribe the centre line (size 55 mm above zero). Set the height gauge to the level of the centre line.	– Choose an even number for reference.
5. Scribe the sizes from the datum line up and down.	

6. Put the steel sheet on the worked longitudinal edge and set the height gauge to "zero" level.	
7. Scribe the sizes in this plane.	
8. Prick-punch the guide marks for the dividers. Scribe the radii according to specified size.	
9. Scribe the oblique lines between radii and corner points by means of steel scribe and steel straight edge.	
10. Scribe the check circles in the oblong hole by means of dividers (radius 5.0 mm).	
11. Prick-punch check marks on all scribed lines.	
12. Calculate the bore line based on specified width of double-point punch.	– Equations: $d = y - 0.2 \text{ mm}$ $x = d/2 + 0.5 \text{ mm}$
13. Scribe the bore line by means of steel scribe and steel measuring tool. Prick-punch by means of double-point punch.	
14. Final inspection.	– Dimensions and cleanness of scribing,

Completion

- Drill and chip the bow; file all edges.
- Weld threaded rings to it (Instruction example 9.5.).
- Insert a lead-screw (Instruction examples 9.5 and 8.2) into one threaded ring,
- Pin together a head-piece and the lead-screw (Instruction example 7.6.).
- Insert a hexagon-head screw M10 x 15 as counterpart for the lead-screw into the other threaded ring.



Bow for C Clamp

2.5.

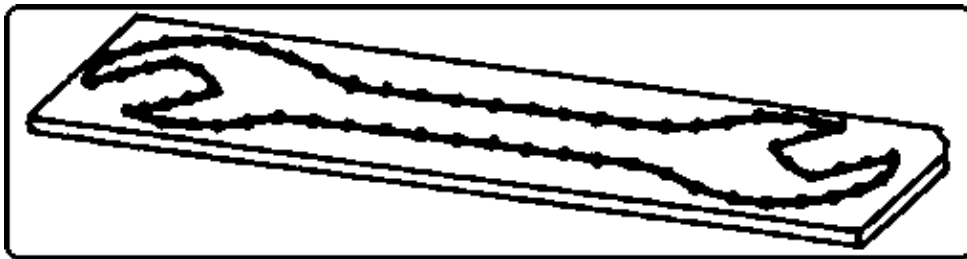
3102

Instruction example 2.6. Open-end wrench 19/24

To practise scribing of curved and straight lines, based on datum lines, and producing a bore line.

Material

Cold work sheet steel with 1 – 1.1 % carbon content
 Thickness: 6–8 mm
 Width: approx. 50 mm
 Length: approx. 230 mm



Hand tools

Steel scriber, dividers, mark-out punch, double-point punch, centre punch, engineers' hammer.

Measuring and testing tools

Steel measuring tool, universal protractor.

Accessories

Surface plate, copper sulphate solution, brush, steel-sheet insert of equal thickness.

Required previous knowledge

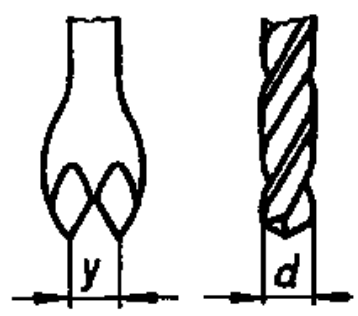
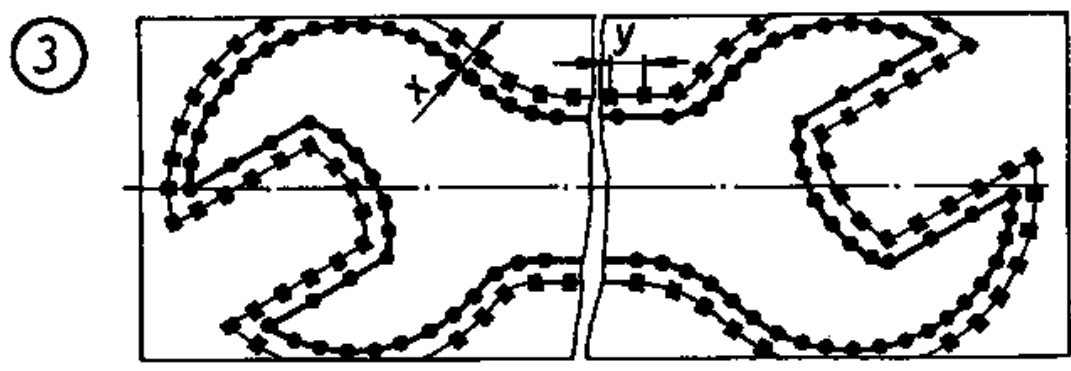
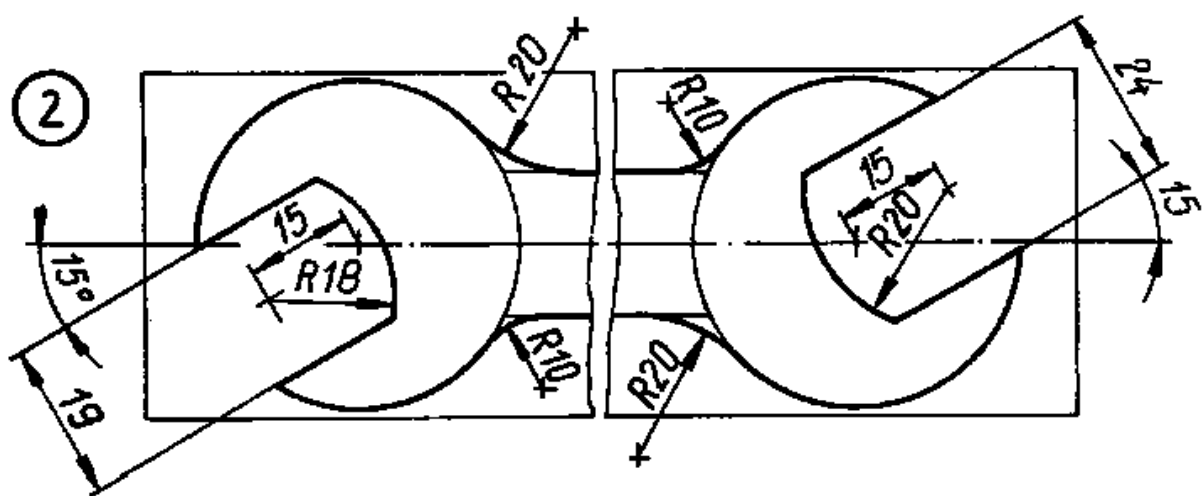
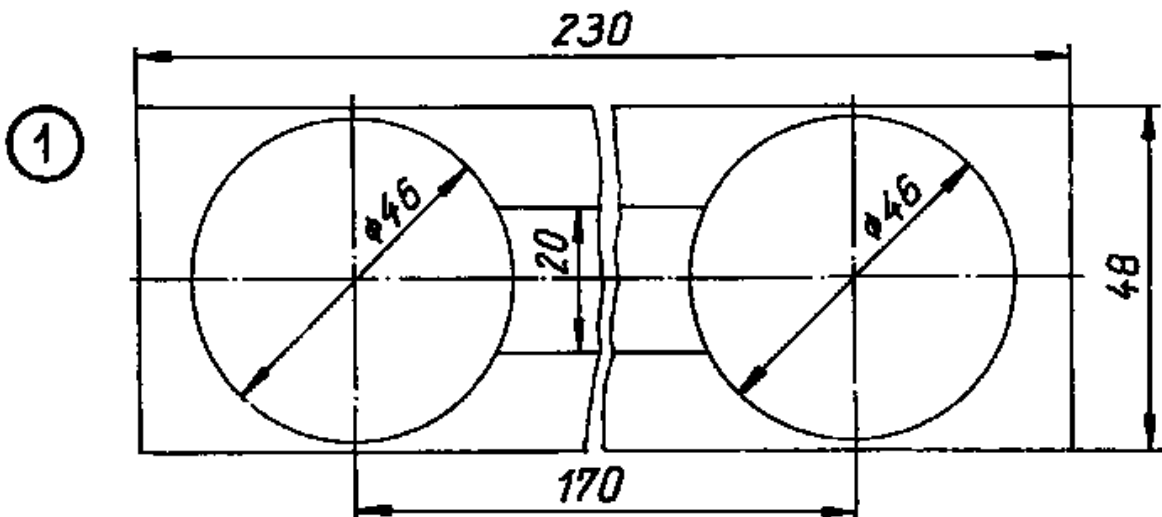
Reading of drawings, measuring, application of simple mathematical equations.

Sequence of operations	Comments
1. Arrange the working place, prepare the working materials.	– Check for completeness.
2. Coat surface with copper sulphate solution. Scribe two crossing centre lines.	– Stage (1)
3. Scribe datum lines (170 mm distance) for centres of circles.	
4. Prick-punch supporting points for the dividers and scribe circle lines and web lines (size 20 mm).	
5. Scribe 15° inclined datum lines for openings of the wrench by means of universal protractor. Scribe and prick-punch the supporting points for the dividers for all radii.	– Stage (2) For 20 mm radii use insert (supporting points are outside the workpiece).
6. Finish the contour of the open-end wrench. Provide all outer lines with check punch-marks.	– Punch-mark distances for straight lines: 7 – 10 mm and for curved lines: 3 – 4 mm.

7. Calculate the bore line according to specified width of double-point punch.	– Equations: $d = y - 0.2 \text{ mm}$ $x = d/2 + 0.5 \text{ mm}$
8. Scribe the bore line and prick-punch by means of double-point punch.	– Stage (3)
9. Final inspection.	– Dimensions and cleanness of scribing.

Completion:

Drill and file. Slightly chamfer all edges. Mark openings of wrench. After hardening the wrench can be used for hexagon-head screws of sizes M



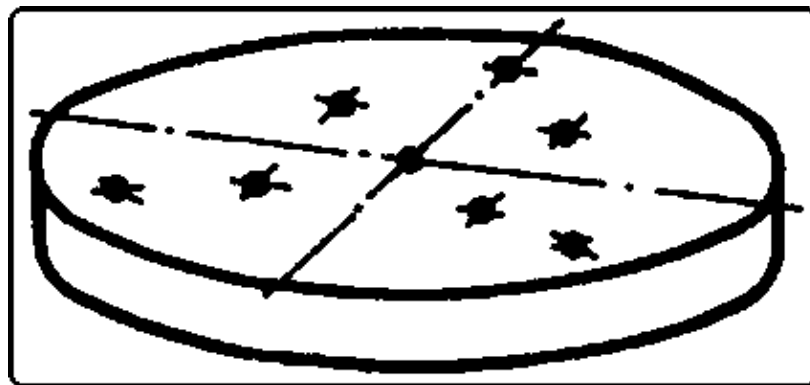
			2.6.
			22
		Open-end wrench 19/24	3102

Instruction example 2.7. Base plate

To practise scribing of circular lines by means of dividers and steel measuring tool and scribing of a bore line.

Material

Sheet steel (approx. 380 MPa)
 Thickness: approx. 6 mm
 Width: 75 mm
 Length: 75 mm



Hand tools

Dividers, centre punch, double-point punch, engineers' hammer.

Measuring and testing tools

Steel measuring tool, centre square

Accessories

Surface plate

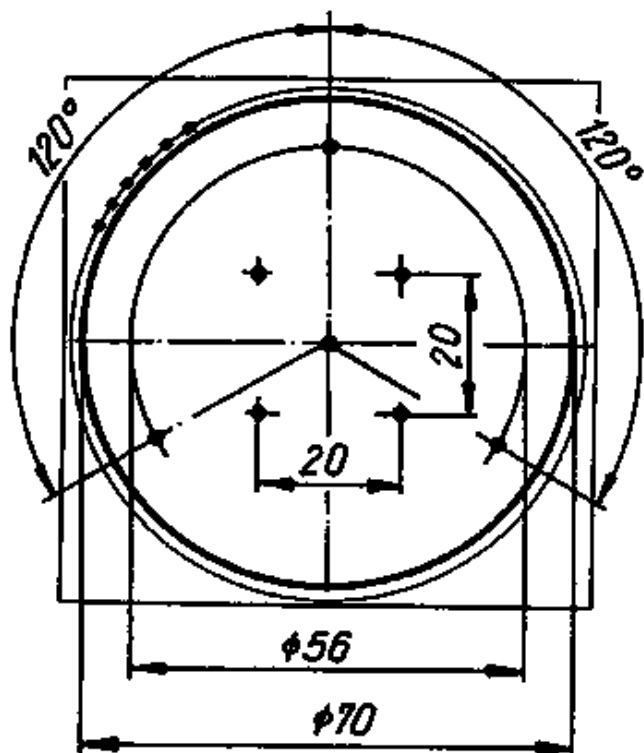
Required previous knowledge

Reading of drawings, measuring

Sequence of operations	Comments
1. Arrange the working place, prepare the working materials.	– Check for completeness.
2. Scribe the centre by means of the centre square and prick-punch by means of the centre punch. Scribe the circumference.	
3. Scribe the crossing centre lines and the hole circle 65 dia. Set the dividers six times on the hole circle to determine 3 points as per sketch for the holes to be drilled. Prick-punch the points. Scribe the bore line.	– Equations: $d = y - 0.2 \text{ mm}$ $x = d/2 + 0.5 \text{ mm}$
4. Scribe the holes at 20 mm distances with reference to the centre-line cross. Prick-punch the points.	
5. Final inspection.	– Dimensions and cleanness of

Completion

Drill according to instructions of the instructor.



				2.7.
		Base plate		31026

Base plate

